

# 74ABT00

## Quad 2-input NAND gate

Rev. 3 — 11 August 2016

Product data sheet

### 1. General description

The 74ABT00 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT00 is a quad 2-input NAND gate.

### 2. Features and benefits

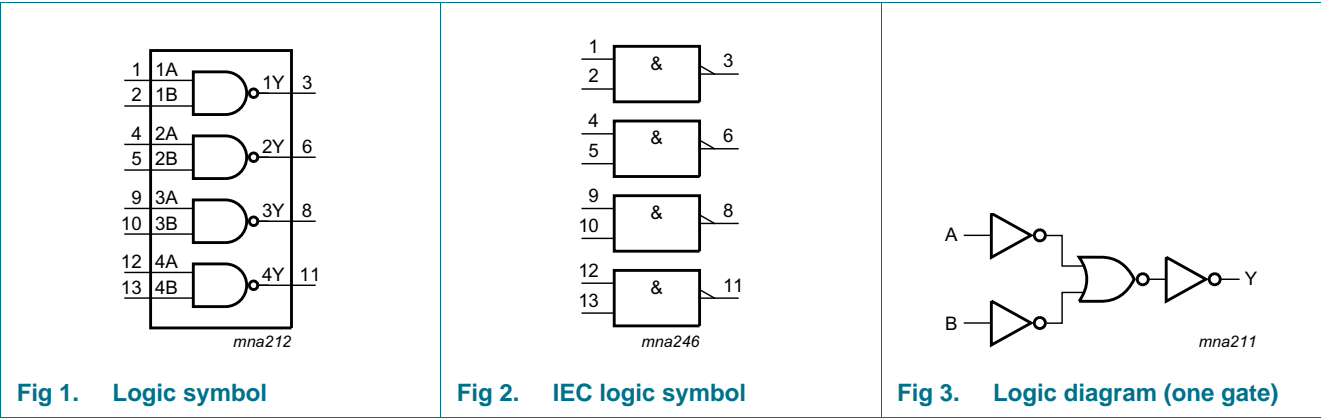
- Latch-up protection exceeds 500 mA per JEDEC78B class II level A
- ESD protection:
  - ◆ HBM JEDEC22-A114F exceeds 2000 V
  - ◆ MM JEDEC22-A115-A exceeds 200 V
- Multiple package options
- Specified from –40 °C to +85 °C

### 3. Ordering information

Table 1. Ordering information

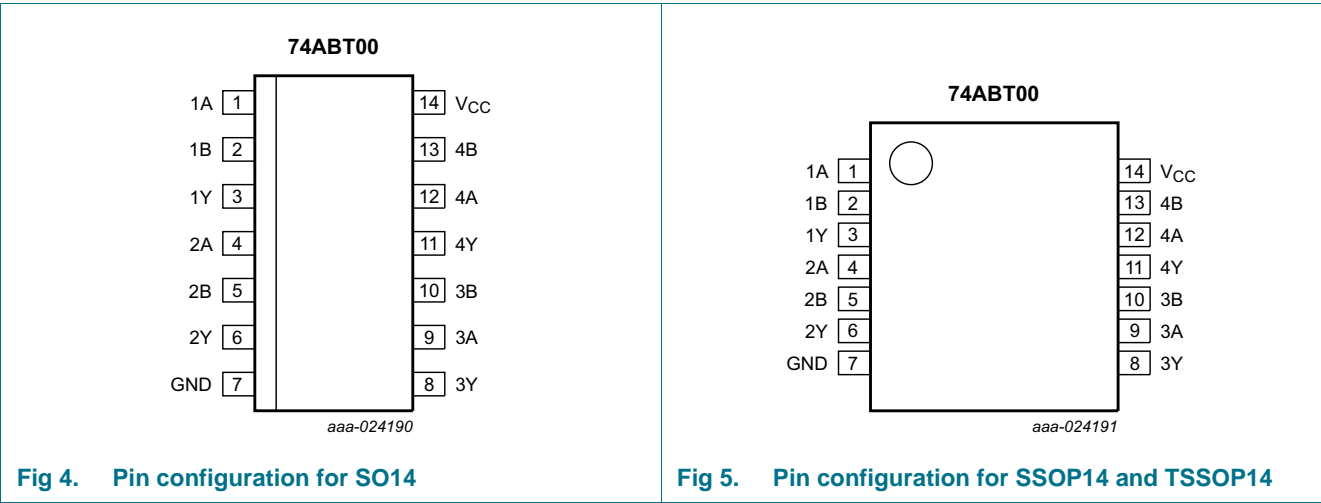
| Type number | Package           |         |  |          |
|-------------|-------------------|---------|--|----------|
|             | Temperature range | Name    | Description  | Version  |
| 74ABT00D    | –40 °C to +85 °C  | SO14    | plastic small outline package; 14 leads; body width 3.9 mm             | SOT108-1 |
| 74ABT00DB   | –40 °C to +85 °C  | SSOP14  | plastic shrink small outline package; 14 leads; body width 5.3 mm      | SOT337-1 |
| 74ABT00PW   | –40 °C to +85 °C  | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |

4. Functional diagram



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol          | Pin          | Description    |
|-----------------|--------------|----------------|
| 1A to 4A        | 1, 4, 9, 12  | data input     |
| 1B to 4B        | 2, 5, 10, 13 | data input     |
| 1Y to 4Y        | 3, 6, 8, 11  | data output    |
| GND             | 7            | ground (0 V)   |
| V <sub>CC</sub> | 14           | supply voltage |

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

| Input |    | Output |
|-------|----|--------|
| nA    | nB | nY     |
| L     | X  | H      |
| X     | L  | H      |
| H     | H  | L      |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care.

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter               | Conditions          | Min  | Max  | Unit |
|-----------|-------------------------|---------------------|------|------|------|
| $V_{CC}$  | supply voltage          |                     | -0.5 | +7.0 | V    |
| $V_I$     | input voltage           |                     | -1.2 | +7.0 | V    |
| $V_O$     | output voltage          | output HIGH or LOW  | -0.5 | +5.5 | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V         | -18  | -    | mA   |
| $I_{OK}$  | output clamping current | $V_O < 0$ V         | -50  | -    | mA   |
| $I_O$     | output current          | output in LOW-state | -    | 40   | mA   |
| $T_j$     | junction temperature    |                     | -    | 150  | °C   |
| $T_{stg}$ | storage temperature     |                     | -65  | +150 | °C   |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

## 8. Recommended operating conditions

Table 5. Operating conditions

Voltages are referenced to GND (ground = 0 V).

| Symbol              | Parameter                           | Conditions  | Min | Typ | Max      | Unit |
|---------------------|-------------------------------------|-------------|-----|-----|----------|------|
| $V_{CC}$            | supply voltage                      |             | 4.5 | -   | 5.5      | V    |
| $V_I$               | input voltage                       |             | 0   | -   | $V_{CC}$ | V    |
| $V_{IH}$            | HIGH-level input voltage            |             | 2.0 | -   | -        | V    |
| $V_{IL}$            | LOW-level input voltage             |             | -   | -   | 0.8      | V    |
| $I_{OH}$            | HIGH-level output current           |             | -15 | -   | -        | mA   |
| $I_{OL}$            | LOW-level output current            |             | -   | -   | 20       | mA   |
| $\Delta t/\Delta V$ | input transition rise and fall rate |             | 0   | -   | 5        | ns/V |
| $T_{amb}$           | ambient temperature                 | in free air | -40 | -   | +85      | °C   |

## 9. Static characteristics

Table 6. Static characteristics

| Symbol          | Parameter                   | Conditions   | 25 °C |            |           | –40 °C to +85 °C |           | Unit          |
|-----------------|-----------------------------|--|-------|------------|-----------|------------------|-----------|---------------|
|                 |                             |  | Min   | Typ        | Max       | Min              | Max       |               |
| $V_{IK}$        | input clamping voltage      | $V_{CC} = 4.5\text{ V}$ ; $I_{IK} = -18\text{ mA}$   | -1.2  | -0.9       | -         | -1.2             | -         | V             |
| $V_{OH}$        | HIGH-level output voltage   | $V_{CC} = 4.5\text{ V}$ ; $I_{OH} = -15\text{ mA}$ ; $V_I = V_{IL}$ or $V_{IH}$  | 2.5   | 2.9        | -         | 2.5              | -         | V             |
| $V_{OL}$        | LOW-level output voltage    | $V_{CC} = 4.5\text{ V}$ ; $I_{OL} = 20\text{ mA}$ ; $V_I = V_{IL}$ or $V_{IH}$   | -     | 0.35       | 0.5       | -                | 0.5       | V             |
| $I_I$           | input leakage current       | $V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ or $5.5\text{ V}$   | -     | $\pm 0.01$ | $\pm 1.0$ | -                | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{OFF}$       | power-off leakage current   | $V_{CC} = 0\text{ V}$ ; $V_I$ or $V_O \leq 4.5\text{ V}$   | -     | $\pm 5.0$  | $\pm 100$ | -                | $\pm 100$ | $\mu\text{A}$ |
| $I_{CEX}$       | output high leakage current | HIGH-state; $V_O = 5.5\text{ V}$ ; $V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$                                    | -     | 5.0        | 50        | -                | 50        | $\mu\text{A}$ |
| $I_O$           | output current              | $V_{CC} = 5.5\text{ V}$ ; $V_O = 2.5\text{ V}$ <sup>[1]</sup>  | -50   | -75        | -180      | -50              | -180      | mA            |
| $I_{CC}$        | supply current              | $V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$   | -     | 2          | 50        | -                | 50        | $\mu\text{A}$ |
| $\Delta I_{CC}$ | additional supply current   | per input pin; $V_{CC} = 5.5\text{ V}$ ; one input at $3.4\text{ V}$ ; other inputs at $V_{CC}$ or $\text{GND}$ <sup>[2]</sup> | -     | 0.25       | 500       | -                | 500       | $\mu\text{A}$ |
| $C_I$           | input capacitance           | $V_I = 0\text{ V}$ or $V_{CC}$   | -     | 3          | -         | -                | -         | pF            |

[1] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

[2] This is the increase in supply current for each input at  $3.4\text{ V}$ .

## 10. Dynamic characteristics

Table 7. Dynamic characteristics

$\text{GND} = 0\text{ V}$ ; for test circuit, see [Figure 7](#).

| Symbol      | Parameter                     | Conditions                                 | 25 °C; $V_{CC} = 5.0\text{ V}$ |     |     | –40 °C to +85 °C; $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$ |     | Unit |
|-------------|-------------------------------|--|--------------------------------|-----|-----|--|-----|------|
|             |                               |  | Min                            | Typ | Max | Min  | Max |      |
| $t_{PLH}$   | LOW to HIGH propagation delay | nA, nB to nY; see <a href="#">Figure 6</a> | 1.0                            | 2.5 | 3.6 | 1.0  | 4.1 | ns   |
| $t_{PHL}$   | HIGH to LOW propagation delay | nA, nB to nY; see <a href="#">Figure 6</a> | 1.0                            | 2.0 | 2.8 | 1.0  | 3.4 | ns   |
| $t_{sk(o)}$ | output skew time              | <sup>[1]</sup>                             | -                              | 0.4 | 0.5 | -  | 0.5 | ns   |

[1] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

11. Waveforms

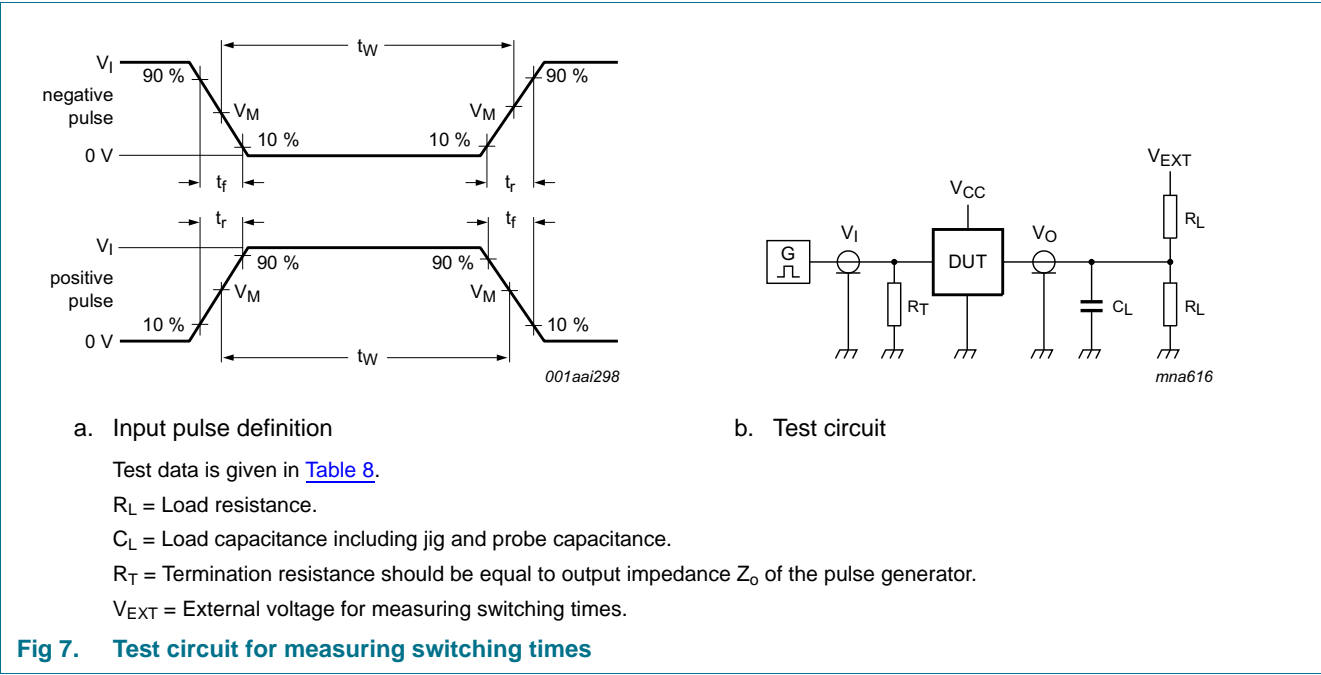
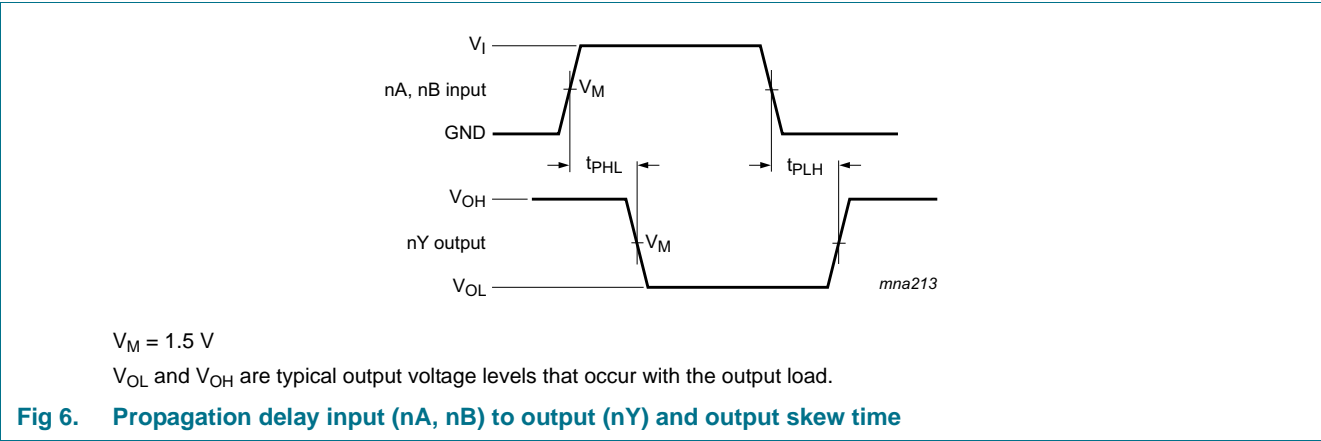


Table 8. Test data

| Input |       |        |                      | Load  |              | $V_{EXT}$          |
|-------|-------|--------|----------------------|-------|--------------|--------------------|
| $V_I$ | $f_i$ | $t_W$  | $t_r, t_f$           | $C_L$ | $R_L$        | $t_{PHL}, t_{PLH}$ |
| 3.0 V | 1 MHz | 500 ns | $\leq 2.5\text{ ns}$ | 50 pF | 500 $\Omega$ | open               |

12. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

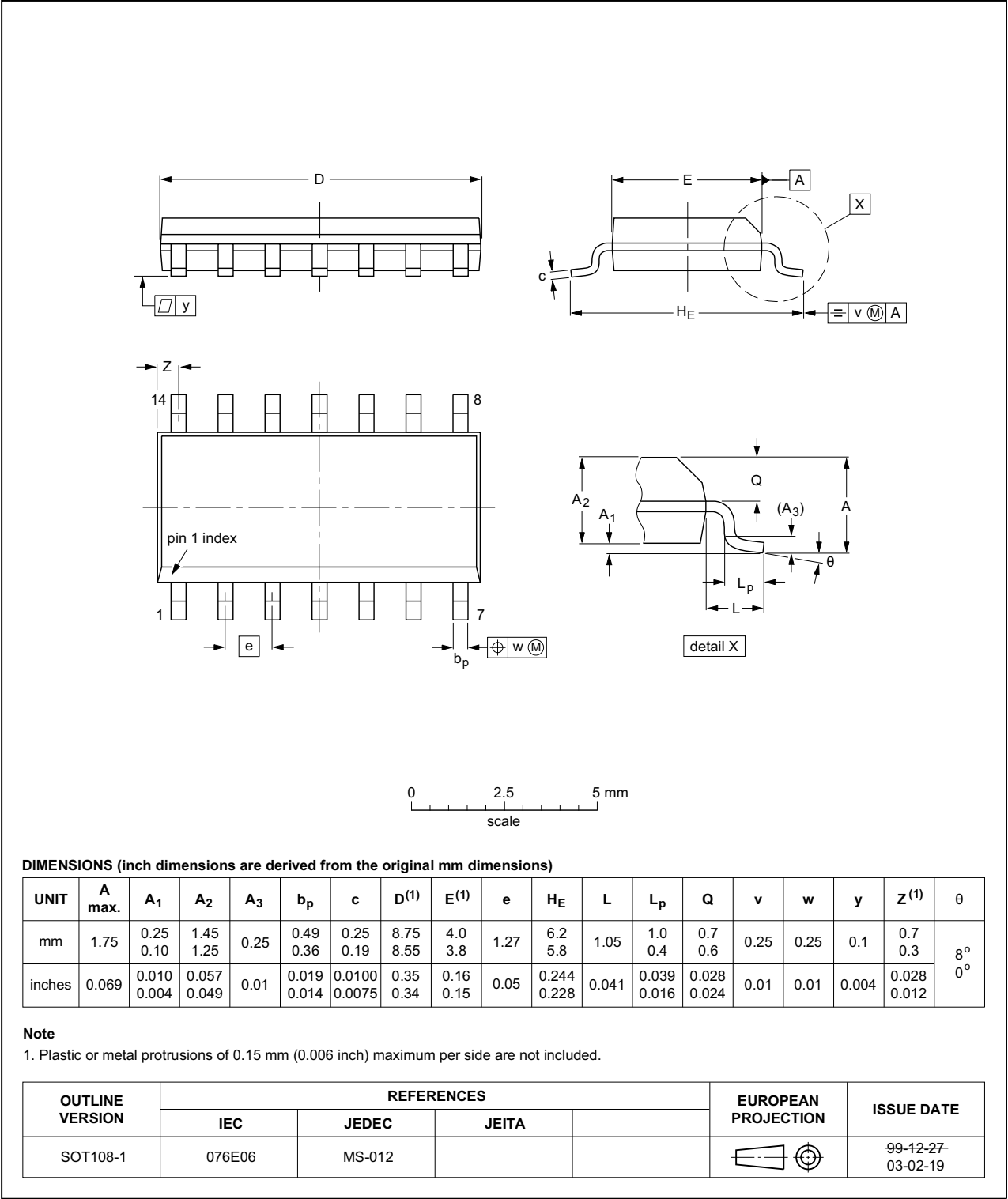


Fig 8. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

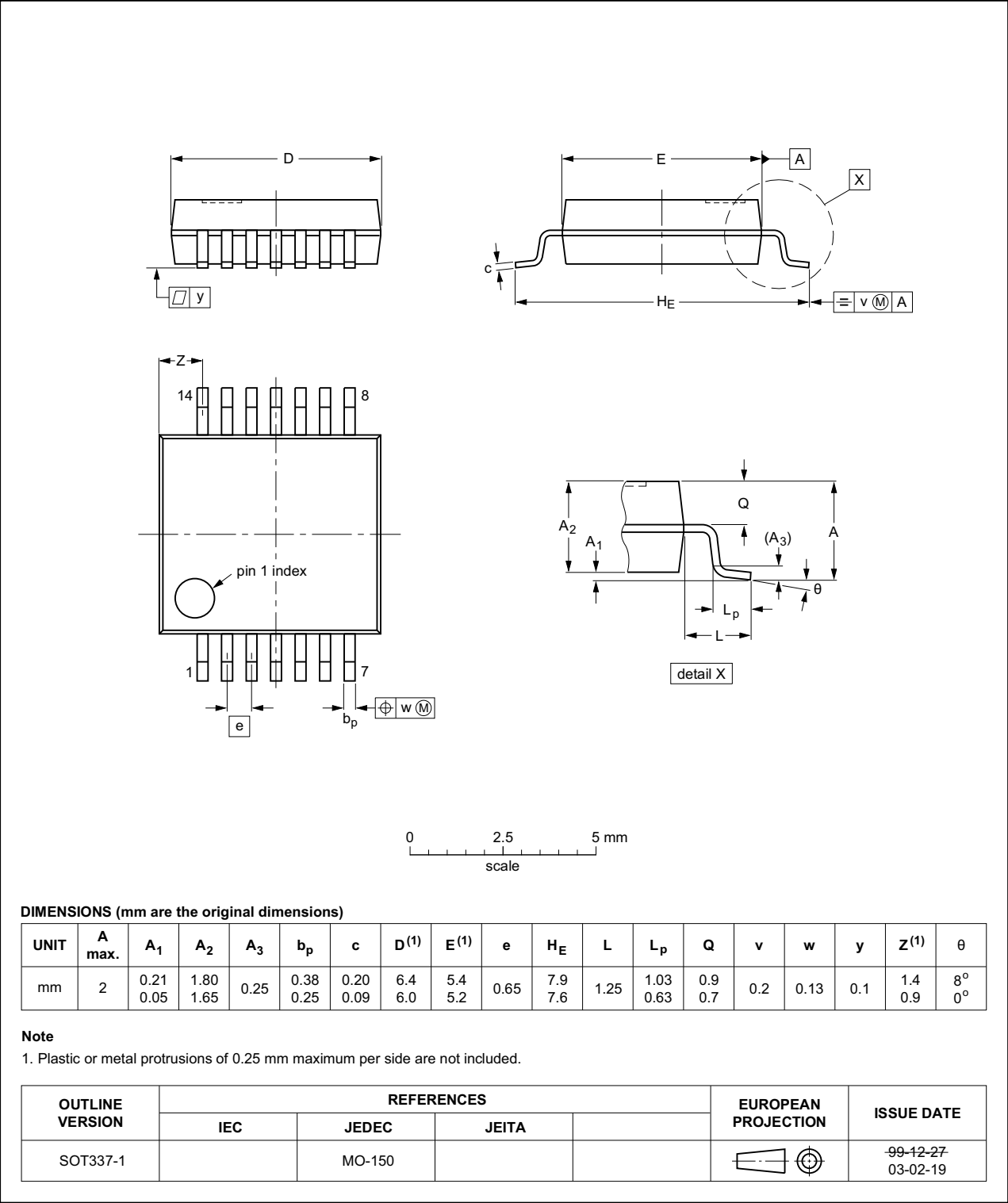


Fig 9. Package outline SOT337-1 (SSOP14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

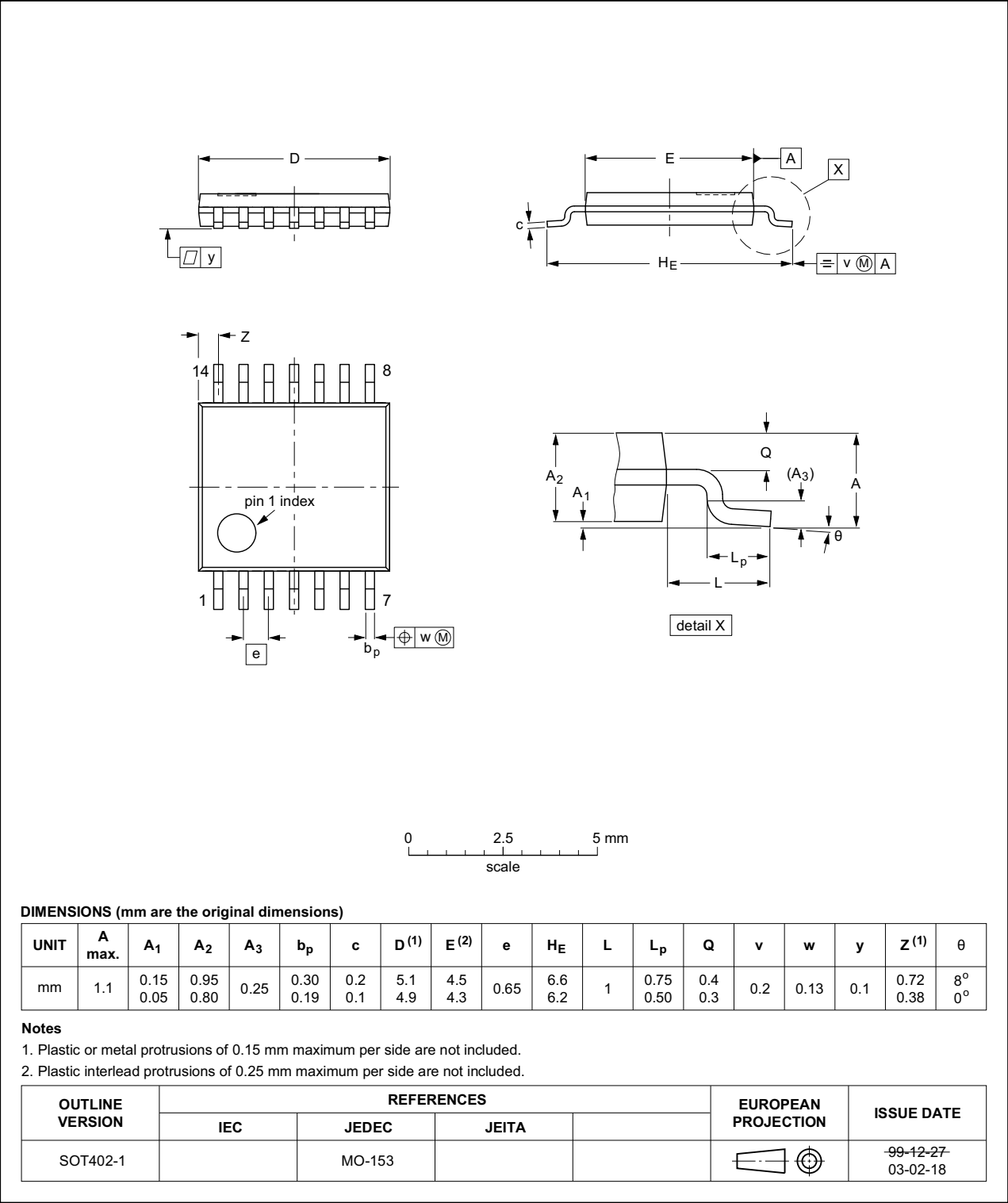


Fig 10. Package outline SOT402-1 (TSSOP14)



## 13. Abbreviations

Table 9. Abbreviations

| Acronym | Description                                     |
|---------|---|
| BiCMOS  | Bipolar Complementary Metal-Oxide Semiconductor |
| DUT     | Device Under Test                               |
| ESD     | ElectroStatic Discharge                         |
| HBM     | Human Body Model                                |
| MM      | Machine Model                                   |

## 14. Revision history

Table 10. Revision history

| Document ID    | Release date   | Data sheet status     | Change notice | Supersedes  |
|----------------|--|-----------------------|---------------|-------------|
| 74ABT00 v.3    | 20160811   | Product data sheet    | -             | 74ABT00 v.2 |
| Modifications: | <ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul> |                       |               |             |
| 74ABT00 v.2    | 19950918   | Product specification | -             | -           |

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### 15.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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